

## DISPERSAL OF MISTLETOE BY BIRDS

BY GEORGE MIKSCH SUTTON

THAT birds are an important agent in the dissemination of mistletoe (*Phoradendron*, *Loranthus*, and allied genera) has long been common knowledge; but the more I have seen of birds and mistletoe, and the more I have read concerning the relationships between the two, the more convinced I have become that the 'common knowledge' referred to is only half-knowledge at best. Weaver and Clements, in their standard work, "Plant Ecology" (Second Edition, 1938), sum up this half-knowledge thus: "Mistletoe, a parasite on trees, often of considerable economic importance, is disseminated by birds. After eating the enveloping fleshy rind, the slimy seeds which frequently stick to their bills may be wiped off upon the branches where they are perched and, hence, in places suitable for germination" (p. 128).

Some birds may, indeed, wipe slimy mistletoe seeds from their bills, but birds which I have watched while they were eating mistletoe berries certainly have not removed the enveloping fleshy rind; they have swallowed the berries whole. They may, I believe, occasionally regurgitate a berry and wipe it from the bill, but I have never observed this. Such regurgitated berries probably would not be very sticky. I am convinced that comparatively little dissemination of mistletoe is accomplished through bill-wiping; that most of it is, indeed, accomplished through defecation. What is more, there is a remarkable correlation between this whole process of dissemination-through-defecation and the digestive apparatus of at least some of the bird-disseminators. Serventy and Whittell, in "A Handbook to the Birds of Western Australia," have this to say about the Mistletoe-bird (*Dicaeum hirundinaceum*): "This bird, as its name implies, is intimately associated with mistletoe (*Loranthus*) and is its most active disseminator. As an adaptation to this specialized diet the muscular portion of the stomach . . . has virtually disappeared and the alimentary canal (including the oesophagus, glandular portion of the stomach and the intestine) appears superficially to be an even duct, with no enlargements" (p. 309).

Now for a brief discussion of my first Cedar Waxwing (*Bombycilla cedrorum*) specimen. I shot the bird near Fort Worth, Texas, many years ago. It was one of a large flock perched in the very top of an oak. As I picked it up I was greatly impressed with its sleek plumage and soft colors. Since I had, with my own eyes, seen it and its fellows gobbling mistletoe berries only a few minutes before, I was not surprised when two whole mistletoe berries dropped from its mouth. On skinning it later, however, I *was* surprised when I encountered more mistletoe berries—indeed what appeared to be only partly digested berries—long before I had removed the skin. These I squeezed, quite uninten-

tionally, from the anus as I was wrestling with the problem of skinning over the tail.

The seeds were covered with a translucent pulp so viscous that it stuck first to the feathers (which I was trying hard to keep clean), then to my fingers. I had to wipe my fingers thoroughly in getting rid of the seeds and stickiness. After finishing the skin I opened the body and found many more of the slimy seeds in the large intestine. Most of the berries in the stomach proper were not slimy for their outer covering was still intact.

I have collected several Cedar Waxwings since that early year. Without exception, I believe, specimens which I have taken in the southern United States have had partly digested mistletoe berries in their alimentary tracts. In recent years, in México, I have become acquainted with other confirmed mistletoe-eaters, notably the beautiful little stub-tailed 'tanagers' known as euphonias. Along the Río Sabinas, in southern Tamaulipas, the Bonaparte's Euphonia (*Tanagra lauta*) and slightly smaller Lesson's Euphonia (*T. affinis*) are common, and both are fond of the orange-colored berries of a *Phoradendron* which grows luxuriantly in the lowlands thereabouts. Small flocks of the birds bound along from clump to clump, eating gluttonously. So exclusively do they feed on these berries that, if one wants to observe them, all one has to do is wait a short while near a clump whose berries are ripe.

While collecting specimens of these euphonias in 1938, 1939 and 1941 I noted that invariably the lower intestine contained partly digested mistletoe berries and very little else. I did not, regrettably, examine the stomachs.<sup>1</sup> I made a point of frightening the feeding flocks with a sudden slapping of hands, causing them to fly off. Not badly alarmed, they alighted close by for an instant of chirping and defecating. Examining the droppings which fell, I found these to contain—again invariably—partly digested mistletoe berries. The phenomenon struck me as strange. There were mistletoe berries by the thousand in the vicinity, food enough for all the euphonias and to spare. But why this incomplete digestion? Why not half as much swallowing and twice as much digesting? The more I pondered the question the busier my mental image of the birds seemed to be. Their quest for this favorite food seemed to be little short of frantic.

<sup>1</sup> Wetmore (1914. *Auk*, 31: 458-461), in discussing the alimentary tract of the Puerto Rican Euphonia (*Tanagra musica sclateri*), calls attention to a "degeneration of the ventriculus into a thin membranous band and a straightening of the stomach to facilitate the passage of food . . ." Wetmore believes that these euphonias subsist entirely on mistletoe berries and that they break the "outer skin with their bills and swallow the single seed surrounded by its adhesive pulp." Euphonias which I have observed in México appeared to be swallowing the berries whole. Further observations are in order. Too, the possibility that the genus *Tanagra* belongs in the Dicaeidae rather than in the Thraupidae must be carefully investigated. This would seem to be a fantastic suggestion, to be sure, but the resemblance in size and proportions between *Tanagra* and some dicaeids is certainly close.

In Hidalgo, in 1939, and in Michoacán, in 1949, I became acquainted with another euphonia, the very beautiful Blue-hooded species, *Tanagra elegantissima*, the subject of our frontispiece. I was prepared to find this bird fond of mistletoe. The first individuals I ever saw (in the mature oak woods above Jacala, Hidalgo) led me to clumps of mistletoe within a few minutes after my encountering them. When I skinned them I found highly viscous, partly digested berries ready to leave the anus.

In Michoacán, the Blue-hooded Euphonias which lived near Roger Hurd's and my camp along the old Pátzcuaro trail in the early spring of 1949 shared their mistletoe with a larger bird—the elegant Gray Silky-Flycatcher (*Phylloscopus cinereus*). I watched these delightful birds gorging on mistletoe berries and was not in the least surprised, on skinning them, to find partly digested berries in their lower intestines. In addition to the many greenish white berries in their stomachs were a few large, elongate, dark blue berries which were wholly unfamiliar to me. These, I was later to learn, on seeing them in the woods, were mistletoe berries of a wholly different sort. Whether they ever passed through in a partly digested state, I cannot say. The only berries of that sort which I found in a Silky-Flycatcher were in the stomach and were wholly undigested.

In Michoacán, in 1949, I spent much of my time painting. Working, as I did, literally for hours under mistletoe-laden trees in which both Blue-hooded Euphonias and Gray Silky-Flycatchers fed, I was much impressed with the fact that their droppings only rarely seemed to reach the ground. I might never have been conscious of this had not caterpillar droppings at times become a great nuisance. Climbing up to investigate, I found the birds' droppings, dozens of them, some on the very tops of twigs or branches, some clinging to the sides, and all stuck fast to the bark, ready—I could but guess—to become little sprigs of mistletoe once germination was brought on by rain. The birds' tendency to keep high—to rest, after feeding, in the very treetops—must, I reasoned, be aiding the mistletoe in its 'struggle to survive,' for the higher the birds perched the less likelihood there was that one of those precious droppings would reach the ground.

I am no botanist, to be sure. What I have just said probably is a slight exaggeration, too. Surely further observations are to be made. But is it not remarkable—is it not, in the best sense of the word, *wonderful*—that the process of evolution should have brought about on the one hand an edible berry, and on the other a digestive apparatus and process which eliminates that berry's skin, but allows the viscous covering of the seed to remain until, out of the bird's body at last, it serves to attach that seed to the branch on which the plant is later to grow?